

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1 1. (Currently Amended) A method for controlling magnetostriction in a free
2 layer of a magnetic memory device, comprising:
3 forming a pinned layer;
4 forming a separation layer over the pinned layer;
5 forming a bilayer, composite free layer, the forming the bilayer, composite free
6 layer includes:
7 forming a first free layer ~~having a first thickness of~~ CoFe; and
8 forming a second free layer ~~having a second thickness, the ratio of the first~~
9 ~~thickness and second thickness being selected to provide a desired magnetostriction of~~
10 NiFe;
11 wherein the forming the first free layer of CoFe and the forming of the
12 second free layer of NiFe further comprises forming a thickness ratio of the first free
13 layer of CoFe to second layer of NiFe by forming the first free layer of CoFe with a
14 predetermined first thickness and forming the second free layer of NiFe with a
15 predetermined second thickness, wherein the ratio of the predetermined first thickness to
16 the predetermined second thickness is selected to provide a predetermined
17 magnetostriction without changing the composition of the first or second free layer.
- 1 2. (Canceled)

1 3. (Original) The method of claim 1, wherein the separation layer is a
2 conductor layer.

1 4. (Original) The method of claim 1, wherein the separation layer is an
2 insulation layer.

1 5. (Currently Amended) A magnetic sensor, comprising:
2 a pinned layer;
3 a separation layer formed over the pinned layer;
4 ~~a first free layer having a first thickness formed over the separation layer; and~~
5 ~~a second free layer having a second thickness formed over the first free layer,~~
6 ~~wherein the ratio of the first thickness and second thickness is selected to provide a~~
7 ~~desired magnetostriction~~
8 a bilayer, composite free layer, the bilayer, composite free layer includes:
9 a first free layer ~~having a first thickness~~ of CoFe formed over the
10 separation layer; and
11 a second free layer ~~having a second thickness~~ of NiFe formed over the
12 first free layer, ~~wherein the ratio of the first thickness and second thickness is selected to~~
13 ~~provide a desired magnetostriction;~~
14 wherein the first free layer of CoFe includes a first predetermined
15 thickness and the second free layer of NiFe includes a second predetermined thickness,
16 the first and second predetermined thicknesses are selected to provide a predetermined
17 thickness ratio of the first free layer of CoFe to second layer of NiFe to provide a
18 predetermined magnetostriction without changing the composition of the first or second
19 free layer.

1 6. (Canceled)

1 7. (Original) The magnetic sensor of claim 5, wherein the separation
2 layer is a conductor layer.

1 8. (Original) The magnetic sensor of claim 5, wherein the separation
2 layer is an insulation layer.

1 9. (Currently Amended) A magnetic tunnel junction sensor, comprising:
2 a magnetic tunnel junction device comprising:
3 a pinned layer;
4 an insulation layer formed over the pinned layer;
5 a bilayer, composite free layer, the bilayer, composite free layer
6 includes:
7 a first free layer ~~having a first thickness~~ of CoFe formed
8 over the separation layer; and
9 a second free layer ~~having a second thickness~~ of NiFe
10 formed over the first free layer; ~~wherein the ratio of the first thickness and second~~
11 ~~thickness is selected to provide a desired magnetostriction;~~
12 wherein the first free layer of CoFe includes a first
13 predetermined thickness and the second free layer of NiFe includes a second
14 predetermined thickness, the first and second predetermined thicknesses are selected to
15 provide a predetermined thickness ratio of the first free layer of CoFe to second layer of
16 NiFe to provide a predetermined magnetostriction without changing the composition of
17 the first or second free layer;
18 a current source coupled to the magnetic tunnel junction device; and
19 a magnetoresistance detector, coupled to the magnetic tunnel junction device, for
20 detecting an electrical resistance through the magnetic tunnel junction device based on
21 magnetic orientations of the first and the second free layers.

1 10. (Canceled)

1 11. (Currently Amended) A magnetic storage system, comprising:
2 a movable magnetic recording medium;
3 a magnetic sensor for detecting magnetic signals on the moveable recording
4 medium, comprising:
5 a pinned layer;
6 a separation layer formed over the pinned layer;
7 ~~a first free layer having a first thickness formed over the separation layer;~~
8 and
9 ~~a second free layer having a second thickness formed over the first free~~
10 ~~layer, wherein the ratio of the first thickness and second thickness is selected to provide a~~
11 ~~desired magnetostriction;~~
12 a bilayer, composite free layer, the bilayer, composite free layer includes:
13 a first free layer of CoFe formed over the separation layer; and
14 a second free layer of NiFe formed over the first free layer;
15 wherein the first free layer of CoFe includes a first predetermined
16 thickness and the second free layer of NiFe includes a second predetermined thickness,
17 the first and second predetermined thicknesses are selected to provide a predetermined
18 thickness ratio of the first free layer of CoFe to second layer of NiFe to provide a
19 predetermined magnetostriction without changing the composition of the first or second
20 free layer;
21 a magnetoresistance detector, coupled to the magnetic sensor, for detecting an
22 electrical resistance through the magnetic sensor based on magnetic orientations of the

23 first and the second free layers; and
24 an actuator, coupled to the magnetic sensor, for moving the sensor relative to the
25 medium.

1 12. (Canceled)

1 13. (Currently Amended) A spin valve sensor, comprising
2 a bilayer free layer structure, the bilayer free layer structure including a first free
3 layer of CoFe having a first predetermined thickness formed and a second free layer of
4 NiFe having a second predetermined thickness formed over the first free layer, wherein
5 ~~the ratio of the first thickness and second thickness is selected to provide a desired~~
6 ~~magnetostriction~~ a thickness ratio of the first free layer of CoFe to second layer of NiFe is
7 selected to provide a predetermined magnetostriction without changing the composition
8 of the first or second free layer;
9 a ferromagnetic pinned layer structure having a magnetic moment;
10 a nonmagnetic conductive separation layer disposed between the free layer
11 structure and the pinned layer structure;
12 an anti-ferromagnetic pinning layer coupled to the pinned layer structure for
13 pinning the magnetic moment of the pinned layer structure;
14 hard magnetic thin films in an abutting relationship with the free layer structure
15 on both sides of the free layer structure; and
16 a ~~seed layer~~ seed layer structure adjacent the pinning layer structure.

1 14. (Canceled)

1 15. (Currently Amended) A spin valve sensor, comprising
2 a bilayer free layer structure, the bilayer free layer structure including a first free
3 layer having of CoFe a first predetermined thickness and a second free layer of NiFe
4 having a second predetermined thickness formed over the first free layer, wherein ~~the~~
5 ~~ratio of the first thickness and second thickness is selected to provide a desired~~
6 ~~magnetostriction~~ a thickness ratio of the first free layer of CoFe to second layer of NiFe is
7 selected to provide a predetermined magnetostriction without changing the composition
8 of the first or second free layer;
9 a self-pinned layer structure having a magnetic moment;
10 a nonmagnetic conductive separation layer disposed between the free layer
11 structure and the self-pinned layer structure;
12 hard magnetic thin films in an abutting relationship with the free layer structure
13 on both sides of the free layer structure; and
14 a ~~seed layer~~ seed layer structure adjacent ~~the~~ a pinning layer structure.

1 16. (Canceled)

1 17. (Currently Amended) A magnetic sensor, comprising:
2 means for providing a fixed magnetic orientation;
3 bilayer means, disposed over the means for providing a fixed magnetic
4 orientation, for sensing a magnetic field, the bilayer means including first and second
5 means for providing a magnetization that is free to rotate, the first means having a first
6 predetermined thickness of CoFe for sensing a magnetic field and second means having a
7 second predetermined thickness of NiFe for sensing a magnetic field;
8 means for separating the means for providing a pinning field from the bilayer
9 means;
10 ~~wherein the ratio of the first thickness and second thickness is selected to provide~~
11 ~~a desired magnetostriction~~ wherein a thickness ratio of the first free layer of CoFe to
12 second layer of NiFe is selected to provide a predetermined magnetostriction without
13 changing the composition of the first or second free layer.